

542,256

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
5 August 2004 (05.08.2004)

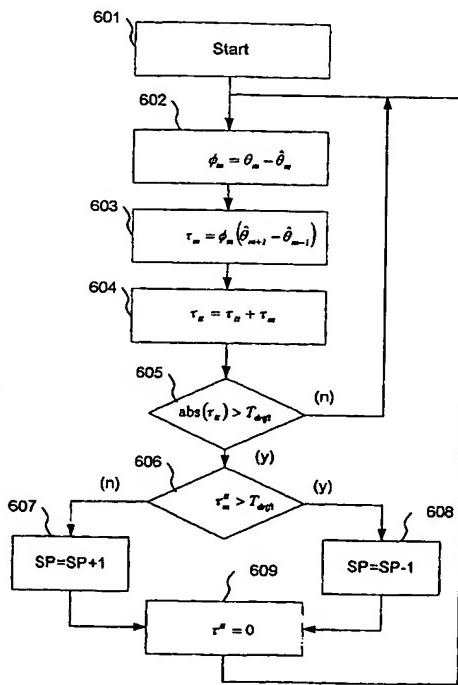
PCT

(10) International Publication Number
WO 2004/066549 A1

- (51) International Patent Classification⁷: H04L 7/02 (72) Inventor; and
 (21) International Application Number: PCT/EP2003/014486 (75) Inventor/Applicant (for US only): WILHELMSSON, Leif [SE/SE]; Lyftvägen 5, S-240 10 Dalby (SE).
 (22) International Filing Date: 16 December 2003 (16.12.2003) (74) Agent: ZACCO DENMARK A/S; Hans Bekkevolds Allé 7, DK-2900 Hellerup (DK).
 (25) Filing Language: English (81) Designated States (national): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, EG, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
 (26) Publication Language: English (84) Designated States (regional): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
 (30) Priority Data:
 03388003.0 17 January 2003 (17.01.2003) EP
 60/441,424 21 January 2003 (21.01.2003) US
 (71) Applicant (for all designated States except US): TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-164 83 Stockholm (SE).

[Continued on next page]

(54) Title: A SIGNAL PROCESSING APPARATUS AND METHOD FOR DECISION DIRECTED SYMBOL SYNCHRONISATION



(hat theta) (I) (theta, theta') (II)

(57) Abstract: A signal processing apparatus (400;800) comprising: a demodulator (e.g. a PSK demodulator) (407;900) arranged to demodulate a received signal, which carries consecutive symbols (a_1, \dots, a_n) at a symbol rate, wherein the demodulator (407;900) is arranged, based on sample values of the received signal, to calculate an error value (ϕ_m) of a given symbol relative to a decision-directed determination of an expected symbol value (I); and a phase-shifter (406,409;801;1002,1013) arranged to shift the phase of sampling points in time at which points in time, sample values of the received signal is provided to the demodulator (407;1000). The invention is characterized in that the apparatus (400;900) comprises a processor (408;601;1000) arranged to evaluate an error metric (τ), at the symbol rate, for a given symbol as a function of the error value (ϕ) and symbol values (II), and to determine whether to shift the phase of the sampling points in time based on further evaluation of the error metric (τ). Thereby an optimal sampling instant can be provided based on estimation of Inter Symbol Interference.

WO 2004/066549 A1



Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*